REMARKS

The Applicants request reconsideration of the rejection. Claims 1-26 are now pending.

Claim 1 was rejected under 35 U.S.C. 102(b) as being anticipated by Hori, U.S. Patent 4,821,273 (Hori). The Applicants traverse as follows.

Claim 1 has been amended to define the optical-fiber communication equipment as including an etalon having two or more transmission bands and a free spectral range that is matched with a channel grid interval of wavelength division multiplexing optical-fiber communication, determined by ITU recommendation. Further, Claim 1 has been amended to characterize the optical-fiber communication equipment as including a laser light source having a wavelength that can be changed so that the wavelength is fixed to a desired value of the channel grid interval.

As noted on Page 35, lines 1-2 of the specification, the free spectral range (FSR) is defined as the interval between repeated peaks. According to the disclosed invention, the etalon's thickness t, refractive index n, and surface reflectivity R permit the FSR to be matched with the ITU-TS grid. Matching the FSR with the ITU-TS grid enables a

wavelength error to be detected by wavelength selection characteristics having a desired sharpness over a wide wavelength range. By utilizing the FSR in this way, wavelength locking of the laser light source to a wavelength on the channel grid is made simply and more accurately than in the prior art.

For example, Hori employs a conventional interference filter without matching the FSR of the filter to the channel grid interval of wavelength division multiplexing optical-fiber communication. On this basis alone, amended Claim 1 is patentably distinguishable from Hori.

Additionally, however, the etalon itself is quite different from the filter of Hori. Hori uses an interference filter to provide the conventional apparatus with a semiconductor laser having stabilized wavelength/output power. To achieve this objective, Hori sets the bandwidth to a predetermined wavelength. On the other hand, the present invention uses an etalon that has many transmission bands corresponding to the ITU grid (grid channels).

Even if one were to consider Hori as being capable of employing a plural-wavelength bandwidth, one must consider that Hori substantially discloses a single band by use of the filter. Moreover, the invention uses an etalon having several

tens to several thousands of transparent peaks, with a narrow interval between peaks of about .01 nm to .08 nm. If one were to attempt to provide Hori's interference filter with plural transparent peaks, the interval between these peaks would be about 1 μm. Therefore, Hori's interval is at least several hundred times that of the etalon of the present invention. Accordingly, the person of ordinary skill would never modify the Hori interference filter to achieve the etalon of the present invention.

Moreover, the interference filter disclosed by Hori does not provide a repetition of transparent peaks. See, for example, Fig. 11. Hori shows a single transparent peak, explaining, "Fig. 11 is an illustration showing a transmittance curve with respect to the wavelength of this interference filter. The interference filter has such function as to pass a light of a predetermined wavelength bandwidth."

These distinctions are important because the claimed etalon is not a mere filter, but has many transparent peaks. In other words, the transparent peaks of the etalon correspond to the FSR being matched with the channel grid interval of wavelength division multiplexing optical-fiber communication, as set forth in current Claim 1.

In this regard, it is believed that the expression "determined by ITU recommendation" set forth in Claim 1 is well understood by the ordinary skill in this art to refer to the ITU-TS (International Telecommunication Union-Telecommunication Standardization Sector) grid. The Applicants enclose a copy of the ITU-T Recommendation G.694.1 (06/2/002), and an exemplary table of ITU grid channels (100 GHz spacing). The number of channels of the grid is, for example, in a range from several scores or hundreds to thousands of channels. For example, the 100 GHz spacing presents 73 channels in the table for ITU grid channels, and for 12.5 GHz, even more channels in Table G.694.1.

Because Claim 1 has been amended to recite an etalon having two or more transmission bands and having a free spectral range matched with a channel grid interval of wavelength division multiplexing optical-fiber communication, determined by ITU recommendation, wherein a wavelength of the laser light source is enabled to be changed so that said wavelength is fixed to a desired value of the channel grid interval of wavelength division multiplexing optical-fiber communication, Claim 1 is patentably distinguishable from Hori.

Claims 1, 3-4, 6, 8, 9, 12 and 14-15 were rejected under 35 U.S.C. 102(b) as being anticipated by Tei, U.S. 6,144,025 (Tei). The Applicants traverse as follows.

Like Hori, Tei fails to disclose the claimed etalon having a free spectral range matched with the channel grid interval of wavelength division multiplexing optical-fiber communication, determined by ITU recommendation, wherein the wavelength of the laser light source can be changed so that the wavelength is fixed to a desired value of the channel grid interval. Accordingly, Claim 1 is patentably distinguishable from Tei.

Claim 6 is also patentably distinguishable from Tei. For example, whereas Claim 6 recites an etalon located in the parallel light path of light from the laser source, wherein the etalon has a plurality of light transmission portions having desired wavelengths existing at given wavelength intervals, Tei's optical band pass filter 8 is a multi-layer optical interference filter laminating alternately high refractive index films and low refractive index films having the optical film thickness of a quarter of transmission wavelength. By installing a cavity layer in an optical film thickness of half wavelength between the high and low refractive index films, the optical band pass filter

characteristic for transmitting light of a specific wavelength is composed. See Column 4, lines 57-65 of the patent.

Thus, Tei's band pass filter does not have a plurality of light transmission portions having desired wavelengths at given wavelength intervals. As noted on Page 4 of the present specification, a band pass filter having a single transmission peak cannot handle a multiple-wavelength channel. To meet Claim 6, therefore, one would have to provide a separate band pass filter 8 for each wavelength, which is not realistic.

For each of the foregoing reasons, Claim 6 is patentably distinguishable from Tei.

Claim 12 also recites an etalon having a plurality of light transmission portions having desired wavelengths existing at given wavelength intervals, and is thus patentable over Tei for the same reasons that Claim 6 is patentable over Tei. In addition, Claim 12 recites that the wavelength interval of the light transmission portions is equivalent to a channel grid interval of wavelength division multiplexing optical-fiber communication. Advantages of this feature have been discussed above. Of course, a band pass filter passing a specified band or wavelength cannot be said to have wavelength intervals equivalent to a channel grid interval.

The Applicants note the Examiner's reference to Column 1, lines 15-21 of Tei. This passage, however, discusses prior art optical communication efforts to realize wavelength division multiplex communication with stabilized laser outputs. Tei itself is directed to wavelength stabilization; however, as noted above, Tei's band pass filter does not achieve wavelength division multiplex communication. Therefore, the passage is irrelevant to the analysis of Claim 12.

Claim 12 also recites that any of the plurality of lasing wavelengths of the laser light source is equivalent to an emitting wavelength corresponding to a desired wavelength that is shifted to a wavelength portion having a highest transmittance among the plurality of light transmission portions provided by the etalon. As noted above, Tei's band pass filter does not provide plural light transmission portions.

In addition, Column 6, lines 16-22 of Tei (cited by the Examiner) discuss wavelength adjustment of the laser among plural individual wavelengths. The passage does not discuss plural light transmission portions of an etalon, or that any one of plural lasing wavelengths is equivalent to an emitting wavelength corresponding to a desired wavelength that is

shifted to a wavelength portion having a highest transmittance. Rather, Tei adjusts the laser's output wavelength to achieve a desired wavelength with zero error.

Claims 3-4, 8-9, and 14-15 are dependent claims that inherit the patentability of their respective independent claims. Accordingly, they are patentably distinguishable over Tei as well.

Claims 2, 7 and 13 were rejected under 35 U.S.C. 103(a) as being unpatentable over Tei in view of Miller, U.S. 4,790,634 (Tei). These dependent claims also inherit the patentability of their respective independent claims, and because Miller does not provide the teachings missing from Tei, the combination of Tei and Miller cannot render the obvious these dependent claims.

Similarly, Watterson et al., U.S. 6,526,079; Munks et al., U.S. 6,353,623; and Watterson et al., U.S. Patent Publication No. 2004/0091002 do not supply the teachings missing from Tei. Therefore, dependent Claims 5, 10-11, and 16-23 are patentable at least based on the patentable features of their respective independent claims.

New Claim 24 is dependent from Claim 1 and thus patentable as well. In addition, new Claim 24 recites that the thickness of the etalon is in a range from 0.1mm to 10 mm.

Tei discloses that the thickness of the alternating high and low refractive index films is a quarter of a transmission wavelength, and the thickness of the cavity layer is a half wavelength. Thus, the thickness of Tei's band pass filter is at most about 1 μm (for a wavelength in a range of 1.3mm to 1.6mm), which is one-hundredth to $1/10^4$ of the thickness of the claimed etalon. The difference is not obvious, because the thicker the etalon, the smaller the interval between transparent peaks. The smaller interval is useful for matching the spectral range etalon with the channel grid interval as discussed above.

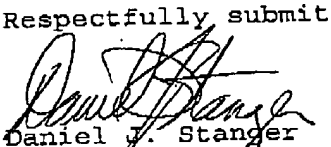
New Claim 25 is also dependent from Claim 1, and thus inherits its patentable features. Additionally, new Claim 25 recites that the thickness of the etalon is increased so that the shifted quantity caused by a temperature change of the etalon is equal to a difference of a narrowed free spectral range and the grid interval. Tei (and the various secondary references applied with it) do not address this feature in any way. The feature is important because a thick etalon gives a narrow free spectral range, and the increasing temperature simply causes the transmission peak to be shifted toward a longer wavelength, which can be compensated to match the grid

interval. Of course, Tei cannot achieve this feature by its structure.

New Claim 26 is dependent from Claim 25, and thus inherits its patentable features. Further, locating the laser light source in the etalon on the same cooler ensures that temperature effects are reflected equally on these two elements.

In view of the foregoing amendments and remarks, the Applicants request reconsideration of the rejection and allowance of the claims.

Respectfully submitted,



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